

# NEW MEDICAL TECHNOLOGY FOR THE INJURED SOLDIER

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## Introduction

The Army Science and Technology (S&T) Master Plan and the Army Medical Department Modernization Plan are key elements in defining strategies and priorities for future combat casualty care medical technologies. In particular, the Army S&T Master Plan provides direction for development of medical technologies while the Army Medical Department Modernization Plan outlines investment strategies for modernizing military forces.

Combat casualty care modernization efforts include both forward resuscitation and stabilization treatment. This encompasses improved procedures for controlling hemorrhaging, revised resuscitation guidelines, and improved diagnostics and monitoring of injured personnel.

Battlefield mortality factors indicate that approximately 50 percent of deaths occur as a result of hemorrhaging, with remaining deaths split between central nervous system injuries and bacterial infection. The reduction in time that is often allotted for troops to deploy necessitates lighter and smaller equipment. This will hopefully be addressed by Army transformation plans that call for conversion of the Army into a light, mobile force requiring deployability of a brigade combat team within 96 hours after liftoff, a warfighting division in 120 hours, and five divisions in 30 days. Medical forces' mobility must be equal to the warfighters they support. In addition, as unit functions modularize, they must support containerized

equipment for rapid deployment. The priority of evacuation systems is paramount when considering the extended battlespace and lack of specialized care in theater. Therefore, new and improved platforms must be considered in future development. Some of the Army's medical modernization initiatives are discussed in the remainder of this article.

## Soldier (Medic) Initiatives

The medic is the critical link for providing care to the seriously injured soldier. Next to the physician and physician's assistant, the medic is the first line of defense in providing critical care on the battlefield. When this article was written, the 91W Program was scheduled to begin Oct. 1, 2001. It will enhance the U.S. Army's forward medical capability through improved initial and sustainment training of medics.

Training will focus on improving trauma treatment and stabilization skills through national certification as an emergency medical technician (EMT) prior to graduation.

Controlling hemorrhaging is imperative to saving lives on the battlefield. Recent development of the dry fibrin sealant bandage could potentially reduce blood loss from battlefield injuries up to 85 percent. In animal studies, the hemostatic dressing has stopped hemorrhaging when applied directly to an injury. Further human clinical testing will be required. However, early results indicate this product could have lifesaving impact on future battle injuries.

In the future, the miniaturization of medical equipment such as the digital X-ray system, vital sign monitor, and lab test device will change how care is provided within the forward

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area. More durable and smaller equipment originally designed for hospital applications is now becoming available for field use. The ultrasound scanner, a technology previously too bulky for field use, is now available in a portable hand-held unit that can provide images of internal organs used to evaluate internal bleeding. Another example is an electrically powered oxygen generator (under development) that will eliminate the need for bulky oxygen tanks.

## Communications Initiatives

Medical Communication for Combat Casualty Care (MC4) is the Army's medical communication architecture and is fully integrated into all echelons of medical care. MC4 connects databases; administrative procedures; medical diagnostic, monitoring, and treatment systems; and evacuation platforms. Health care providers at all levels of care will be able to exchange information via digital, audio, video, and electronic media. Integrating medical information across health care echelons facilitates world-class service to soldiers. Some of the MC4 subcomponents under development are discussed below.

*The Personal Information Carrier.* This device provides a transportable medical record that is stored electronically on a microchip and retained by the soldier. Prototypes are the size of the soldier's dog tag and provide comprehensive personal readiness data in addition to critical medical data. Initial design criteria include a read/write capability so that information can be readily updated through a special reader, and memory to store a specified amount of information.

*The Warfighter Physiologic Status Monitor.* This is an active-status device that uses biosensors placed either directly on the soldier or indirectly on the uniform to monitor a soldier's real-time status. This sensor not only generates vital signs data (heart rate, blood pressure, respiration rate, body temperature), but it also monitors sleep and alert status, energy balance, psychological status, workload capacity, and stress. This wearable wireless sys-

tem can log sensor information and transmit it to a centralized data center. Further study is required to define algorithms and develop measurements to accurately report the soldier's status.

*The Warrior Medic.* This is an integrated system used in conjunction with the Land Warrior tactical network and has been dubbed the soldier's "911 system." Warrior Medic can alert the medic/commander of an existing casualty, make an emergency call for help, and identify and locate battlefield casualties. In addition, as an information system (similar to a personal data assistant), it allows the medic to record initial treatment, request assistance, and provide reference guides for treatment assessment.

*Telemedicine.* Another component of MC4 involves using video and audio conferencing to either exchange information or consult with a patient at a remote location. Telemedicine has been touted as the solution to providing critical surgical support to the far-forward battle zone. Telemedicine has been successfully used in treating patients in Operation Desert Storm, Somalia, and Kosovo. The general consensus is that availability of bandwidth and power requirements, coupled with durability of equipment, make this a less than desirable option for far-forward wartime applications.

## Evacuation Initiatives

The Armored Treatment Vehicle (AMTV) Program's demise and the pending decision on the Armored Evacuation Vehicle's (AMEV's) continued development have left ground evacuation platforms in a state of uncertainty. This becomes an increasing concern as medical capability on the battlefield decreases and the need for patient evacuation increases.

The Medical Evacuation rotary wing UH-60Q replaces the UH-1V and upgrades the UH-60A helicopter with an additional materiel upgrade, while optimizing the aircraft for a medical evacuation mission. The UH-60Q can evacuate casualties as far forward as the situation permits; conduct combat search and rescue; perform shore-to-ship evacuation; and move medical

equipment and personnel in emergency situations. The helicopter's assets include an equipment storage area, onboard oxygen and suction, electric power for equipment, a combat litter system, and a hoist. The navigational system includes a global positioning system, a forward looking infrared system, and tactical air navigation equipment. Communication capabilities support all functions of MC4 for command and control and telemedicine, data bus, and high-frequency multiband radio.

## Conclusion

Battlefield casualty experience indicates that approximately 50 percent of battlefield deaths result from hemorrhaging, with remaining deaths split between central nervous system injuries and bacterial infection. Although the number of injured soldiers who receive hospital care has declined steadily, battlefield mortality remains at 20 percent with no demonstrable decline, and is becoming the focus of advanced technology developments. Experience has also shown that the more rapidly medical treatment is available to injured soldiers, the greater the chance for survival.

The emphasis of new medical technology on the battlefield focuses on saving lives and will have a significant impact in decreasing battlefield mortality.

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